DETAILED SYLLABUS

THIRD SEMESTER

Sl. No.	Course Category	Subject Code	Subject Title	L	T	P	Contact Hours/week	Credit	Full Marks
1.	Humanities Science - 2	HS 301	Effective Technical Communication	3	0	0	3	3	100
2.	Basic Science - 7	BS 302	Mathematics-III	2	1	0	3	3	100
3.	Basic Science - 8	BS 303	Biology for Engineers	2	0	0	2	2	100
4.	Engineering Science - 5	ES 304	Engineering Mechanics	2	1	0	3	3	100
5.	Program Core - 1	PC CE 305	Materials, Testing and Evaluation	3	1	0	4	4	100
6.	Program Core - 2	PC CE 306	Surveying and Geomatics	3	1	0	4	4	100
7.	Program Core - 3	PC CE 307	Materials, Testing and Evaluation Lab.	0	0	2	2	1	100
8.	Program Core - 4	PC CE 308	Surveying Practice	0	0	2	2	1	100
9.	Program Core - 5	PC CE 309	Civil Engineering Drawing	0	0	2	2	1	100
10.	Mandatory Course - 3	MC 310	Indian Constitution	2	0	0	2	0	100
			Total :	**17**	**4**	**6**	**27**	**22**	**1000**

Effective Technical Communication

Course Code	HS 301
Course Title	Effective Technical Communication
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	1st year B. Tech
Course Category	Humanities Science (HS)
Number of classes	36 hours

Course Outcomes:

At the end of the course, the student will be able to -

CO Number	CO Description	K-level
CO-1	Understand the nature and objective of Technical Communication relevant for the work place as Engineers	K-2
CO-2	Utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.	K-3
CO-3	Develop effective verbal and non-verbal communication skills.	K-3
CO-4	Analyze ethical, legal, cultural, and global issues affecting Technical Communication and Develop appropriate life skills.	K-4

Module 1: Essentials of Communication (09 hrs)

What is Communication, Process of Communication, Levels of communication, The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group) Communication Barriers to communication, Non-verbal Communication, , Technology Enabled communication, Impact of Technology, Selection of appropriate communication Technology, Importance of Technical Communication, Differences between general and technical communication.

Module 2: Technical Writing Skills (09 hrs)

Technical writing process – Choosing right words, phrases and sentence patterns, clarity of purpose, planning content, effective style of writing, formatting, proofreading.

Technical Reports & Proposals: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Writing of Reports & Proposals.

Business letters: Sales & Credit letters; Claim and Adjustment Letters; Letters of Enquiry, Order Placement letters.

Email Writing: Reasons for popularity; guiding principles for composition; some common pitfalls; maintaining common etiquette.

Module: 3 Workplace Communication (09 hrs)

Applying for a job: Skimming advertisements; Writing job applications; Preparing CV, Resume.
Group Discussions: Group Discussion types; GD as a part of selection process; Key skills to succeed in group discussions; Dos and Don'ts of group discussions; Use of body language in GDs.
Job Interviews: Objectives; Types; Stages of Interview, Face to face Interviews; Telephonic Interviews.
Effective Business Presentations: Importance in workplace communication; Planning, Preparing, Organizing, Rehearsing, and Delivering Oral presentations, Handling Questions; Visual aids in presentations; Power Point Presentations
Ethics in Communication: Communication challenges in culturally diverse workforce; Bias-free communication

Module: 4 Developing soft skills/ Life Skills (09 hrs)

Introduction to soft skills: Soft skills as a competitive weapon in today's changing workplace.
Classification of soft skills: Time management, Attitude, Responsibility, Ethics & Values, self-confidence, Teamwork and Interpersonal skills, Problem solving skills.
Personality Development: Developing Right personality to enhance Life Skills, Personality types; Personality attributes; and Leadership Qualities.
Body Language : Emotions displayed by body language: Aggressive, Submissive, Attentive, Nervous, Upset, Bored, Relaxed, Defensive; Hand Shake; Eye Contact; Posture and Positioning.
Personality traits and soft skills in early stages of career advancement and for future career advancement.

List of Software/Learning Websites

1. http://www.free-english-study.com/
2. http://www.english-online.org.uk/course.htm
3. http://www.english-online.org.uk/
4. http://www.talkenglish.com/
5. http://www.learnenglish.de/

References / Suggested Learning Resources:-

1) Sanjay Kumar & Pushp Lata Communications Skills , 2nd Edition,Oxford University Press
2) Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
3) Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press.
4) Personality Development, Harold R. Wallace & L. Ann Masters, Cengage Learning, NewDelhi.
5) Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
6) Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
7) Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, McGraw Hill & Co. Ltd., 2001, New Delhi.
8) A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
9) Skills for Effective Business Communication by Michael Murphy, Harward University, U.S

****

Mathematics-III

Course Code	BS 302
Course Title	Mathematics-III
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	B.Tech 1st Year Mathematics
Course Category	Basic Science (BS)
Number of classes	36 hours

Course Outcome:-

After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Solve problems in 1st and 2nd order linear Partial Differential Equations.	K-3
CO-2	Show fourier series expansion of a given function and solve PDEs by variables separable method.	K-3
CO-3	Identify mean and variance of a given probability distribution.	K-3
CO-4	Solve numerically algebraic/transcendental equation and ordinary differential equations.	K-3

Course Content:-

Module 1: Partial Differential Equations (10 hrs)

First order partial differential equations, solutions of first order linear and quasi-linear partial differential equation (Pp + Qq =R) by Lagrange method. Homogeneous and non-homogeneous type of second order linear differential equation with constant coefficients by complimentary function and particular integral method.

Module 2: Fourier series (08 hrs)

Expansion of a function in Fourier series for a given range - Half range sine and cosine expansions. One-dimensional wave equation and one-dimensional heat flow equation - method of separation of variables - Fourier series solution.

Module 3: Probability (08 hrs)

Classical and axiomatic definition of probability, conditional probability, Bayes' theorem, independent events, random variables, expectation and higher order moments, probability mass function and probability density function, distribution function, Sample space, Events, Random Variables; Definitions of probability, conditional Probability, examples of discrete and continuous distributions: Normal, Poisson, Binomial distributions.

Module 4: Numerical Analysis (10 hrs)

Numerical solution of algebraic and transcendental equations by Regula-Falsi method Newton-Raphson's method; Finite Differences - Newton's Forward, backward difference interpolation formulae - Lagrange

interpolation; Numerical Integration with Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule; Solving first order differential equations –Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta method of 4th order.

References / Suggested Learning Resources:-

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 1965.
2. Rajnish Verma & H.K. Dass, Higher Engineering Mathematics, S Chand, 2014.
3. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993
4. Jain, Iyengar and Jain, Numerical methods for Scientific and Engineering Computation, New Age International Publications, 2008.
5. Erwyn Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition, 2008.

****

Biology for Engineers

Course Code	BS-303
Course Title	Biology for Engineers
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	Basic Science (BS)
Number of classes	26 hours

Course Outcome:

After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Demonstrate the understanding of biology and its branches, major classifications of life, Cells, Cellular systems their functions and biological molecules.	K-2
CO-2	Illustrate the molecular basis of genetic information and the flow of genetic information from DNA to RNA to protein and the concept of mutations, re-combinations and its applications.	K-2
CO-3	Classify microorganisms, growth, nutrition with their various methods used for the isolation, identification, control and maintenance of microbial cultures.	K-4
CO-4	Explain the fundamental principles of energy transactions in physical and biological and physiological systems, basic metabolisms.	K-2

Course Content:

Module 1: Introduction to Biology, Classification and Biomolecules (8 hours)

Detailed content of the module: Introduction to Biology and its branches. Molecular taxonomy- three major kingdoms of life. Prokaroytic and Eukaryotic cells. Energy and Carbon utilization. Cells: Animal

and Plant cell structures and functions. Cell cycle and Cell division. Transport across cell membrane. Cell signaling.
Molecules of life. Monomeric units and polymeric structures. Sugars, starch and cellulose. Lipids, Amino acids and proteins. Nucleotides, DNA and RNA. Proteins- structure and function. Proteins as enzymes, transporters, receptors and structural elements. Enzyme classification. Mechanism of enzyme action. Enzyme kinetics.

Module 2: Fundamentals of genetics and flow of informations (6 hours)

Detailed content of the module: General principles of genetics, Concept of segregation and independent assortment. Molecular basis of information transfer, molecular basis of coding and decoding genetic information. DNA as genetic material. Concept of genetic code. Define gene in terms of complementation and recombination. Mutation. Recombinant DNA technology. Gene mapping. Application of recombinant DNA technology, recombinant products available in the market and at laboratory scale.

Module 3: Microbiology and applications (6 hours)

Detailed content of the module: Microorganisms and environment: Identification and classification of microorganisms. Ecological aspects of single celled organisms. Microbial integrations. Growth, nutrition and reproduction. Growth kinetics. Isolation and identification of microorganisms. Pure cultures and their characteristics. Maintenance of cultures. Sterilization. Physical and chemical methods of control of microorganisms. Management of toxic industrial wastes.

Module 4: Fundamentals of energy transaction and metabolism (6 hours)

Detailed content of the module: Thermodynamics –laws and its application in biological systems. Energy yielding and energy consuming biochemical processes.
Metabolism- Glycolysis & Krebs cycle, Role of ATP and concept of energy change. Equilibrium constant. Physiological steady-state, Living body as a thermodynamic system.
Fundamental aspects of analysis of living systems; quantitative aspects of physiology and engineering applications to clinical medicine based on body fluid balance, solute transport, basic endocrinology, reproduction physiology, neurophysiology, skeletal and smooth muscle physiology.

References / Suggested Learning Resources:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd. 12th Edition, 2020
2. Guyton and Hall, Medical Physiology, 14th Edition, Elsevier Saunders, 2020.
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.
4. Principles of Genetics, D. Peter Snustad and Michael J. Simmons. 7th Edition, Wiley Publisher, 2015
5. Prescott's Microbiology, Joanne Willey and Kathleen Sandman and Dorothy Wood, 2020. 11th Edition McGraw Hill.

****

Engineering Mechanics

Course Code	ES 304
Course Title	Engineering Mechanics
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	Nil
Course Category	Engineering Science (ES)
Number of classes	36 hours

Course Outcome:- After completion of the course, students will be able to:

CO No	CO Description	K-level
CO-1	Differentiate coplanar, concurrent & non-concurrent forces and their resultants and confidently tackle equilibrium equations and its applications.	K-3
CO-2	Explain centroid of simple figures, centre of gravity, moment of inertia of composite sections & mass moment of inertia of circular plates, cylinder, cone, sphere & hook.	K-2
CO-3	Analyze simple truss, compound truss, frame & virtual work.	K-4
CO-4	Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, analyze D'Alembert's principle and differentiate longitudinal, transverse, torsional and damped vibrations.	K-2

Course Content:-

Module 1: Fundamentals of Engineering Mechanics: (9 Periods)

Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy. Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

Module 2: Centre of Gravity & Moment of Inertia: (9 Periods)

Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Module 3: Trusses, Frames & Virtual Work: (9 Periods)

Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of

Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines; Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

Module 4: Dynamics & Mechanical Vibrations: (9 Periods)

Dynamics - Basic terms & General principles of dynamics, Types of motion, Instantaneous centre of rotation in plane motion, D'Alembert's principle and its application, Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.
Vibration - Basic concepts of Longitudinal, Transverse and Torsional vibrations, Free & Forced vibration, Resonance and its effects, Damped vibration.

References / Suggested Learning Resources:-

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications
11.Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education.
12.Bansal R.K. (2010), A Text Book of Engineering Mechanics by Laxmi Publications.
13.Irving, H.Shames, Engineering Mechanics-Statics and Dynamics, by Prentice-Hall of India.
14.Khurmi R. S. (2010), Engineering Mechanics, S. Chand & Co.
15.NPTEL web or video courses on Engineering Mechanics.
16.Timoshenko & D.H.Young, Engineerring Mechanics,Tata McGraw-Hill publishing Co. Ltd.

****

Materials, Testing & Evaluation

Course Code	PC-CE305
Course Title	Materials, Testing & Evaluation
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	Nil
Course Category	Program core (PC)
Number of classes	48 hours

Course Outcomes: After completion of the course students will be able to-

CO No.	CO Description	K-level
CO-1	Identify the different engineering materials requirement for construction.	K-1
CO-2	Distinguish the properties and characteristics of different engineering materials.	K-2
CO-3	Choose the suitable material for different construction work.	K-3
CO-4	Judge the performance of different engineering materials by testing.	K-6

Course contents:-

Module 1: Building Materials (12 hours)

Classification of engineering materials, study of properties of materials: physical, mechanical, chemical, biological, aesthetical and other complex properties like durability, reliability, compatibility, and economic characteristics. Bricks- Types, Indian Standard classification, absorption, saturation factor, strength in masonry, influence of mortar strength on masonry strength. Tiles: ceramic tiles, paving blocks. Brick masonry, stone masonry and block masonry.

Module 2: Cement and Cement Concrete (12 hours)

Cement: Compounds of different types, setting times, strength. Cement Mortar: Ingredients, proportions, water demand, mortars for plastering and masonry. Concrete: Importance of W/C Ratio, Strength, ingredients including admixtures, workability, testing for strength, elasticity, Bitumen and asphaltic materials, Acoustical material and geo-textiles, rubber and asbestos, water proofing and sealing resins, adhesives.

Module 3: Timber, Paint and Varnishes (12 hours)

Timber: Different types and species of structural timber, defects, influence of defects on permissible stress, preservation, dry and wet rots, Glass and Plastics, Paints and Varnishes. Structural Steel and metal alloys: Products made of ferrous and non-ferrous metals.

Module 4: Standard Testing and Evaluation (12 hours)

Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test; tests; Bending and torsion test. Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Creep.

References / Suggested Learning Resources:-

1. P.C.Varghese, Engineering Materials, 1st edition, PHI Learning.
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications

4. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
6. American Society for Testing and Materials (ASTM), *Annual Book of ASTM Standards* (post 2000)
7. Related papers published in international journals
8. Engineering Materials, Rangwala, Charotar Publication
9. Materials of Construction, Ghosh, Tata McGraw Hill Publications.

****

Surveying and Geomatics

Course Code	PC CE 306
Course Title	Surveying and Geomatics
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	Nil
Course Category	Program core (PC)
Number of classes	48 hours

Course Outcome: After completion of the course students will be able to-

CO Number	CO Description	K-Level
CO-1	Executing the importance of linear, angular and graphical methods involved in surveying to make a plan or map.	K-3
CO-2	Explain the importance of theodolite, traversing, traverse balancing and calculation of volume from a contour map.	K-2
CO-3	Understand the geodetic survey, taking accurate measurements using instruments and adjusting the traverse and curve setting.	K-2
CO-4	Implementing surveying techniques using advanced surveying equipments.	K-3

Course Content:

Module 1: Surveying and Levelling (12 hours)

Introduction and basic concepts: Introduction, classification of surveying, Principles, some basic terms, Scale, Precision, Accuracy and errors.
Linear Measurements: Different methods, Instruments, Ranging out Survey lines, Measurements of lengths by chain, tape, Error in chaining Tape corrections.
Chain Surveying: Principle, Definition of various terms, Instruments, offsets, basic problem in chaining, Obstacles in chaining
Compass Surveying: Principle, Prismatic compass, Bearings, Magnetic declination, Local attraction, Error in compass surveying, Precautions.
Plane Table Surveying: Principle, instruments, Methods, Two and Three point problems.
Levelling: Introduction, definition basic terms, instruments, Method of Levelling, Reciprocal Levelling.

Module 2: Contouring, Theodolite Surveying and Calculation of Area and Volume (12 hours)

Contouring– Definition, uses, characteristics, Method of contouring, Contour Gradient,
Theodolite Surveying – Introduction, Types of Theodolite, Definitions of Terms, Temporary adjustments, Measurement of various angels, Fundamental lines and desire relations, Sources of Error in theodolite work. Traversing, balancing of traverse, Calculation of traverse area.
Area and Volumes: Area from field measurements, Area from plans, Planimeter. Area of cross section, Measurement of volumes, Mass diagram.

Module 3: Curves, Tacheometry and Trigonometrical Levelling (12 hours)

Curve- Introduction, Classification, Elements of curves and notation, Designation of curve, Formula for various elements of curve, setting of horizontal and vertical curve, Field problem in setting out work. Adjustment of Survey instruments.

Tacheometry – Introduction, Use of tacheometry, Different types of Tacheometric measurements, Principle of stadia method, Anallatic lens, Determination of contents, Measurements of horizontal and vertical distance, Substance bar.
Trigonometrical levelling – Introduction, Base of the object accessible, Base of the object inaccessible.

Module 4: Advanced Surveying (12 hours)

Hydrographic Surveying – Introduction, Methods, Sounding, Locating the sounding, Reduction of soundings, the capacity of a reservoir or lake, Stream gauging.
Mordern field survey systems: Electromagnetic distance measurement (EDM) – Principle – Types – Total station, Advantages and application,field procedure for total station survey,Errors
Remote sensing (RS) - basics, platform and sensors, visual image interpretation; Applications of RS. Basics and applications of Geographical Information System (GIS) and Global Positioning System (GPS).

References / Suggested Learning Resources:-

1. Duggal, S.K. Surveying Vol. I and II, Tata McGraw Hill, 2004.
2. Punmia, B.C. Surveying Vol.I and II, Standard Publishers, 1994.
3. Arora, K. R. Surveying Vol. I and II, Standard Book House, 1996.
4. Subramanian. R. Surveying and Levelling, Oxford University Press, 2012
5. N.N. Basak, Surveying and Levelling, Tata Mcgraw Hill
6. Concepts and Techniques of GIS, Lo C.P.Yeung A K W, Prentice Hall, India
7. Introduction to GIS, Kang-tsung Chang, Tata McGraw Hil
8. Remote sensing and GIS, K. Anjali Rao , BS Publication.

****

Materials, Testing & Evaluation Lab.

Course Code	PC-CE307
Course Title	Materials, Testing & Evaluation Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Program core (PC)

Number of classes	24 hours

Course Outcomes: After completion of the course students will be able to-

CO No	CO Description	K-level
CO-1	Operate various types of testing machines	K-3
CO-2	Configure a testing machine to measure tension or compression behavior.	K-2
CO-3	Compute engineering values (e.g. stress or strain) from laboratory measures.	K-3
CO-4	Analyze a stress versus strain curve for modulus, yield strength and other related Attributes.	K-6
CO-5	Identify modes of failure.	K-2

List of Experiments (*Minimum 6 experiments are to be performed. Use of virtual laboratory to perform few experiments may be explored, if available****):***

- Gradation of coarse and fine aggregates
- Tensile Strength of materials & concrete composites
- Compressive strength test on aggregates
- Tension I - Elastic Behaviour of metals & materials
- Tension II - Failure of Common Materials
- Direct Shear - Frictional Behaviour
- Concrete I - Early Age Properties
- Concrete II - Compression and Indirect Tension
- Torsion test
- Hardness tests (Brinnel's and Rockwell)
- Tests on closely coiled and open coiled springs
- Tests on unmodified bitumen and modified binders with polymers.

References / Suggested Learning Resources:-

1. P.C.Varghese, Engineering Materials, 1st edition, PHI Learning.
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications
4. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
6. American Society for Testing and Materials (ASTM), *Annual Book of ASTM Standards* (post 2000)

****

Surveying Practice

Course Code	PC CE 308
Course Title	Surveying Practice
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Program core (PC)
Number of classes	20 hours

Course Outcomes: After completion of the course students will be able to-

CO No	CO Description	K-level
CO-1	Apply the procedures involved in field work and to work as a surveying team.	K-3
CO-2	Check the accurate measurements, field booking, plotting and adjustment of errors can be understood.	K-5
CO-3	Execute conventional surveying tool such as chain/tape, compass, plane table and leveling in the field of civil engineering applications.	K-3
CO-4	Implement surveying techniques using advanced surveying equipments.	K-3

List of Practical (*Minimum 6 practical or more are to be performed. Use of virtual laboratory to perform few experiments may be explored, if available****):***

1. Chain surveying, Chain traverse.
2. Compass surveying - Compass traverse-open and close traverse.
3. Plane table surveying- Radiation, intersection-Traverse- Resection.
4. Leveling: Profile leveling and cross sectional leveling.
5. Theodolite surveying.
6. Determination of Tacheometric Constants.
7. Setting out of curves.
8. Total station.

References / Suggested Learning Resources:-

1. Duggal, S.K. Surveying Vol. I and II, Tata McGraw Hill, 2004.
2. Punmia, B.C. Surveying Vol.I and II, Standard Publishers, 1994.
3. Arora, K. R. Surveying Vol. I and II, Standard Book House, 1996.
4. Subramanian. R. Surveying and Levelling, Oxford University Press, 2012
5. N.N. Basak, Surveying and Levelling, Tata Mcgraw Hill
6. Concepts and Techniques of GIS, Lo C.P.Yeung A K W, Prentice Hall, India

****

Civil Engineering Drawing

Course Code	PC CE 309
Course Title	Civil Engineering Drawing
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Program core (PC)
Number of classes	20 hours

Course Outcome: After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Develop understanding of the brick size, types of closers and brick bonds.	K-3
CO-2	Develop line diagram, section, elevation, key plan, layout and sectional Plan of buildings.	K-6
CO-3	Produce working drawings for reinforcement details of building parts.	K-3
CO-4	Develop hand drafting of any parts of a building and implement the regulations for layout of a plan.	K-3

List of Drawings/ Practical (*Minimum 6 drawings/ practices are to be performed. Use of virtual laboratory to perform few experiments may be explored, if available****):***

1. Brick-Traditional and Modular, Types of Closers & Bats- King Closer, Queen Closer, Bevelled Closer, Metred Closer, Half Bat, Three-Quarter Bat, Bevelled Bat, Squint Bat.
2. English and Flemish Bond- 1×1 brick wall, ½ x ½ brick wall (header and stretcher course), Zig-zag Bond, Diagonal Bond, Herring-Bone Bond.
3. Plan, Elevation and Sectional Elevation of a single storeyed residential building .
4. Plan, Elevation and Sectional Elevation (framed structure) of a two storeyed residential building
5. Plan, Elevation and Sectional Elevation (framed structure) of a public building such as School Building/ Office Building/ Market/ Library.
6. Sectional Elevation of RCC column with footing, slab , beam and Stair case.
7. Plan and section of a Septic Tank.
8. Introduction to Auto CAD- Draw Commands, Editing Commands, Drawing Aids, Creating Text, Basic Dimensions, Inquiry Commands, Editing Dimensions, Hatching and Blocks.

References / Suggested Learning Resources:

1. M. Chakraborti, Civil Engineering Drawing, Bhaktivedanta Book Trust, 2003.
2. B. N. Dutta, Civil Engineering Estimating & Costing.
3. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing company Ltd. New Delhi.

4. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publishers, New Delhi.
5. Sikka, V.B (2013), A course in civil Engineering Drawing, S.K. Kataria & Sons,

****

Indian Constitution

Course Code	MC 310
Course Title	Indian Constitution
Number of Credits	0 (L: 2, T: 0, P: 0)
Prerequisites	Nil
Course Category	Mandatory Course (MC)
Number of classes	25 hours

Course Outcome:-

After completion of the course, students will be able to:

CO Number	CO Description	K-level
CO-1	Explain about framing and nature of Indian Constitution.	K2
CO-2	Identify the fundamental rights and duties of individual and demonstrate the knowledge on Directive Principles of State Policy.	K3
CO-3	Outline the Federal Structure, Centre- State relation, Union Executive and Amendment Procedure	K2
CO-4	Demonstrate the meaning of local self govt., types of local self govt. in rural and urban areas.	K2

Course Content:

Module 1: Constitutional Framework (05 hours)

1. Meaning of Constitutional Law and Constitutionalism.
2. Historical perspective of the Constitution of India.
3. Salient features of the Constitution of India.

Module 2: Fundamental Rights, Duties and Directive Principles of State Policy (06 hours)

1. Fundamental Rights- Articles 14, 19 and 21.
2. Fundamental Duties.
3. Directive Principles of State Policy; Its Legal Status and Significance

Module 3: Nature of India's Political system (07 hours)

1. Federal structure, Distribution of Legislative and Financial Powers between the Union and States.
2. Parliamentary Form of Government- Powers and Position of President of India.
3. Emergency Provisions.
4. Amendment Procedures of the Constitution of India.

Module 4: Rural and Urban Local Self Govt. (07 hours)

1. 73rd Amendment of the Constitution and Panchayati Raj Institutions.
2. 74th Amendment of the Constitution and Urban Local Self Govt. (Municipal Corporation, Municipal Council and Nagar Panchayat).
3. TTAADC.

References / Suggested Learning Resources:

1. Fadia, B.L- "Indian Govt. and Politics" Sahitya Bhawan, Agra.
2. D.D.Basu- "An introduction to the Constitution of India" Lexis Nexis publichers.
3. M.V.Pylee- "Constitutional Govt. in India" S.Chand and Company Ltd.
4. S.C.Kashyap(ed)- "Perspectives on the constitution" Shipra Publication.
5. B.K. Sharma- "Introduction to the Constitution of India" Prentice Hall India Private Ltd.
6. Bhattacharya, D.C. and Banerjee, Malay- "Indian Govt. and Politics" Vijaya Publishing House
7. J.C. Johari- "Indian Govt. and Politics" (2 vols)
8. Das Nityananda- "Grassroot Democracy and Panchayati Raj in Tripura" Progressive Publichers

****